A Novel Technique to Instrument Proximal and Distal Adjacent Segment Pathology

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Objective: Revision surgeries for clinical adjacent segment pathology (ASP) are fraught with challenges. While various aspects of ASP is extensively covered in literature, there is a dearth of information related to the challenges encountered during these revision surgeries and salvage options. In this technical report, the authors describe a novel surgical technique for the management of Clinical ASP.

Methods: A 55 year old, obese diabetic woman, operated 5 years back for a L3-5 decompression and an instrumented postero-lateral fusion (PLF), developed symptomatic vertical instability at L5-S1 as well as lumbar canal stenosis at L2-3. Decompression and extension of the fusion both proximally and distally was planned. Several challenges were identified both technical and patient related and a novel technique developed to stabilise her. L5-S1 trans-foraminal lumbar inter-body fusion (TLIF) and L2-3 decompression and postero-lateral fusion (PLF) was fixed by by-passing the old fixation with proximal and distal screws and connecting rods.

Results: Patient was subsequently mobilised out of bed the next day and continues to do well 1 year post operatively as evidenced by an improved VAS and ODI score.

Conclusion: This technical report describes the current challenges encountered during revision surgery for ASD as well as the steps of a simple, easily implementable and hassle free solution to this unique problem.

Key Words: Spinal stenosis, Spinal instrumentation, Pedicle screws, Revision spine surgery, Spinal fusion

INTRODUCTION

Adjacent segment pathology has becomes a fairly common phenomenon with 5.2-18.5% of patients developing clinically significant ASP requiring surgery at 5 years. Several review articles and level III and IV studies are published that discuss the etiology and risk factors for the development of ASP. Less often discussed are the challenges faced in performing these revision surgeries. The patient studied here is an obese, diabetic lady of African origin suffering from back and leg pain. She was operated 5 years back for a L3-5 decompression and an instrumented postero-lateral fusion (PLF). Her examination and imaging revealed clinical ASD both superiorly and inferiorly to the fusion mass. While she had developed a lumbar canal stenosis at L2-3, she also developed a vertical instability at L5-S1 (Fig. 1). Her VAS/back/leg was 8/10 and 9/10 respectively and her ODI was 67.2. No prior records of her implant system was available. In this paper the authors describe a novel technique developed to instrument the proximal and distal extension of fusion as well as discuss the challenges commonly encountered during revision ASP.

TECHNIQUE

Positioning and Anaesthesia

General anaesthesia was administered. Patient was placed prone on parallel bolsters with the abdomen hanging free.
Surgery

A midline incision taken from L2 to S2 and subcutaneous tissue dissected till the muscle facia was exposed through the entire length of the incision. Sub-periosteal exposure of the L2-L3 and L5-S1 level achieved in the conventional manner. The L2-L3 exposure was continued para-spinally using manual palpation of the implant as a guide. Implant was exposed adequately. Inferiorly this exposure was continued with the L5-S1 sub-periosteal dissection. Care was taken to not violate the superior (L1-2) Supra/Inter-spinous ligaments and also the superior (L2-3) facet joint capsule.

Several attempts were made to remove the implants using instruments of at least 5 implant companies. Failure to remove the rods, forced an alternative strategy.

Extra-capsular entry for both L2 pedicle screws marked, probed and cannulated. Similarly bilateral S1 screws entry prepared, probed and cannulated. Depth measured and a screw length of 10 mm in excess of that measured was chosen both for L2 and S1. The tulips were kept 10 mm above the facet so as to be at a depth more superficial than the previous implant construct (Fig. 2). L5-S1 right facetectomy and disc space prepared for the interbody cage placement and fusion, L2-3 decompressed and graft placed postero-laterally, L2 to S1 distance measured and a connecting rod with the same lordosis as the previous construct placed, by-passing the entire previous fusion mass. Inner nuts were fixed onto the L2 screw. For compression between the two screws a vice-grip was fixed onto the rod close to the S1 screw. A compressor was then used to compress between the vice-grip and the S1 screws. After adequate compression, the inner nuts were tightened for the final time. Final imaging confirmed satisfactory implant placement (Fig. 3).

Sutures were taken over a drain.

RESULTS

Operative time was 174 mins and there was a blood loss of 230 mL. The patient was mobilised out of bed the next day and discharged on the post-operative day 4. There was no implant prominence and wound healing was un-eventful. Her VAS\textsuperscript{back/leg} improved to 3/10 and 2/10 respectively with an ODI of 24.2 at 1 year follow up (Fig. 4).

DISCUSSION

Various treatment options for clinical ASP are described in literature. These range from decompression, extension of fusion and even total disc arthroplasty\textsuperscript{9}. Less often described are the unique set of challenges these surgeries are fraught with. Traditionally, extension of fusion involves removing the inner nut and the connecting rod, instrumenting the involved adjacent vertebra with a pedicle screw and placing a new connecting rod and inner nut or if this fails then using a rod to rod (domino) connector to clasp a new short rod onto the old construct. All this is done after completing the decompression and fusion.
specific work (interbody preparation for PLIF/TLIF or postero-lateral grafting for a PLF). With the rise in the rates of spinal arthrodesis offered, there has been a simultaneous growth in the number of implant companies producing their variation of the pedicle screw rod system in the market. In addition to this, the design evolution of these implants has resulted in many companies discarding the previously used instrument set for a newer system. Poor medical record keeping may also result in the inability to identify the implant system correctly leaving a newer system.

Pedicle screws are routinely used in pedicle screw rod systems in the modern spinal surgery scenario. However, removing the exiting screws is a challenging clinical task. This is mainly attributed to the requirement of specialized skills, equipment, time and cost involved in the procedure, leading to patient discomfort. Since the pedicle screws are placed using a non-guided technique, with minimal or no fluoroscopic guidance, the surgeon is often faced with the risk of suboptimal screw placement. In addition to this, the design evolution of these implants have resulted in many companies discarding the previously used instrument set for a newer system. Poor medical record keeping may also result in the inability to identify the implant system correctly leaving a newer system.

CONCLUSION

In this technical report, we discuss the challenges faced in extending fusion for a clinical ASD and provide a simple, easily implementable and hassle free solution. This fusion bridging technique also reduces operative time and the concurrent risks of prolonged surgery. Knowledge of this ‘bail-out’ technique will provide confidence to surgeons attempting revision surgeries.

REFERENCES